

TRADING OF WATER POLLUTION CREDITS

THIRD PROGRESS REPORT

Prepared by:
Wisconsin Department of Natural Resources
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This report is submitted to the Governor, the Secretary of Administration and the Land and Water Conservation Board according to the provisions of s. 283.84(5), Stats.

Executive Summary

This third annual report to the Governor, the Secretary of Administration, and the Land and Water Conservation Board on the trading of water pollution credits provides an assessment and evaluation of watershed-based trading opportunities in Wisconsin through development of three pilot projects: Red Cedar River, Fox - Wolf, and Rock River Basins. Activities over the past year have included completion of a framework for trading, resolution of a number of administrative and institutional issues, and commitment of several point source dischargers to pursue watershed-based trading. Expectations for next year include completion of trades in the Red Cedar River and the Rock River Basins, and identification of point sources interested in trading in the Fox-Wolf Basin. The Department of Natural Resources (DNR / Department) continues to track watershed-based trading activities and progress in other parts of the country through participation in the Great Lakes Trading Network.

The partnership approach used by those participating the watershed-based pilots projects have provided valuable learning experiences and will result in future environmental gains regardless of whether watershed-based trading is demonstrated as economically and environmentally viable. The projects produced a "state of the art" model for future applications throughout the state. The nonpoint source pollution BMP cost summaries also have statewide applicability.

Section 283.84, Wis. Stats.(1997 Act 27), *Trading of Water Pollution Credits*, requires the DNR to "administer at least one pilot project to evaluate the trading of water pollution credits." The 1997 legislation includes the following provisions:

- Stipulates any trade must reduce water pollution and improve water quality in the project area.
- Specifies trades must occur within an impaired water body and fall within an area including both agricultural and municipal point and nonpoint sources of water pollution.
- Allows trades between permit holders willing to reduce their pollutant load to levels below their permit (point to nonpoint), between a permittee and another entity willing to reduce its pollutant load (point to nonpoint trading), or between the DNR or a unit of government willing to accept payment that will be used to reduce pollutants (brokering).
- Specifies that the trading of pollution credits provided for in the agreement involves the same pollutant or the same water quality standard.
- Limits the term of the agreement to no more than five years.
- Requires the DNR to appoint a local advisory committee for each pilot project.

DNR staff continue to meet with a variety of stakeholders to address issues associated with watershed-based trading. Over the last three years, the three pilot projects have taken different approaches to assessing the feasibility of watershed-based trading. Progress, through continuation of the pilot projects, includes:

- Encouragement of local participation in the pilot projects.
- Development of a framework for the trading process.
- Identification of applicable legal, administrative, and technical issues.
- Evaluation of BMPs and costs associated with reducing phosphorus loads.
- Distribution of project funds.

The **Fox-Wolf Drainage Basin** covers a large area in the northeast part of the state. The watershed-based trading team, headed by the Fox-Wolf 2000 organization, has completed and implemented a number of trade related activities over the last several years and plans to complete additional activities through the end of the calendar year. The City of Ripon recently examined pollutant-based trading to address an increasing demand for wastewater treatment.

The **Red Cedar River Watershed** is located in west central Wisconsin in the Lower Chippewa River Basin. Northern parts of the basin are predominantly forested and agriculture is a dominant land use in the rest of the basin. Two communities remaining active in the watershed-based trading program are Cumberland and Colfax. The partnership has been active in monitoring, developing a phosphorus management strategy, and providing financial support for the pilot.

In the **Rock River Basin**, located in south central Wisconsin, nutrient trading has been actively discussed over the last four years. Work efforts have included an analysis of the legal and institutional issues associated with trading, and evaluating the cost effectiveness of nonpoint source BMPs. Modeling and monitoring efforts have identified the location of the largest sources of phosphorus in the basin, supported calibration of a watershed model, and evaluated changes in water quality. Several point sources in the Basin are actively pursuing trading opportunities.

Introduction

The third annual report to the Governor, the Secretary of Administration and the Land and Water Conservation Board on the trading of water pollution credits describes the progress and status of watershed-based trading activities in Wisconsin. Prepared in response to s. 283.84(5), Stats., this document contains updates on the three pilot projects, which are underway to provide information to be used in coordinating state and local efforts to improve water quality through trading.

Definition

Watershed based (pollutant) trading is allowing one entity to remove or prevent additional pollutant discharges while allowing another to discharge more than would otherwise be required. Under the control of an agreement between the two parties involved, the trade must improve water quality. From an economic perspective, watershed-based trading is a tool to be used in a watershed whereby all sources contribute to reducing pollution without any one entity bearing an excessive financial burden. This shift in responsibility may result in a more equitable, efficient, and cost-effective means to address water quality problems in a watershed.

Goals

The primary focus of watershed-based trading is to ensure that water quality goals are attained and maintained throughout a watershed by implementing the most cost-effective reductions in pollutants from various sources. The immediate goals for the Department of Natural Resources (Department) and the various participating organizations and entities are to:

- evaluate the potential for trading;
- develop and evaluate a framework for trading;
- allow trades to move forward if trading appears to be viable and willing partners exist;
- create a process for future trading.

The types of trades most likely to occur in the pilot projects are point to nonpoint or point to point trading. A point to nonpoint trade occurs when a point source arranges for a nonpoint source to undertake greater than required pollutant reductions as an alternative to the point source upgrading its own treatment. A point to point trade occurs where one point source, instead of reducing its own pollutant discharge, arranges for another point source to undertake a reduction in pollutant discharges greater than would otherwise be required.

General Activities

As described below, primary watershed-based trading efforts continue to focus on the pilots. However, the Department has also participated with other states in the Great Lakes Trading Network (GLTN) organization. This group initially began with Michigan sponsoring the network which consisted of just Great Lakes states. It has since grown to include trading efforts nationwide, providing an opportunity for participants to share experiences and to promote the concept of watershed-based trading. In May, 2000 the GLTN sponsored a conference on trading in Chicago entitled “Markets for the New Millennium – How Can Water Quality Trading Work for You?” Persons active in the Fox-Wolf Basin pilot made a presentation at this conference and the Rock River Basin partners provided an exhibit. The conference was well attended by the active participants of the GLTN, as well as other interested parties.

Progress and Status

The Department selected the Fox-Wolf, Red Cedar River and Rock River Basins as the three pilot areas to explore the feasibility of watershed-based trading among various sources of pollution. Phosphorus has been identified as the primary pollutant of concern for all three pilots. The primary objective of these pilots is to explore cost-effective and geographically targeted solutions for phosphorus reduction. Each pilot is expected to help answer different questions related to the legal, economic and technical aspects of watershed-based trading.

Fox-Wolf Basin

The Fox-Wolf Drainage Basin covers a large area in the northeast part of the state which drains to Green Bay and includes the watershed around Lake Winnebago. A team, headed by the Fox-Wolf Basin 2000 organization, consists of partners from the public and private sector interested in the use of watershed-based trading to address some of the water quality problems in the basin. The goal of this pilot is to establish a trade to assess the feasibility and effectiveness of watershed-based trading to control phosphorus in the basin.

To assess interest levels, the Fox-Wolf Basin 2000 organization conducted a number of stakeholder information and education meetings in each of the three main sub-basins. One community expressing interest in trading was the City of Ripon, which had to expedite completion of a wastewater facility plan to stay in compliance with its WPDES permit. After discussing available treatment options, Ripon decided against pursuing a trade due to concerns about complying with existing phosphorus limits, the timing of a trade, and the uncertainty of correlating phosphorus with other parameters such as BOD and nitrogen.

Phosphorus Limits – Most large point source dischargers in the Lake Michigan Basin, including the City of Ripon, have had to meet a 1 mg/L total phosphorus limit since the mid 1970’s. During the 1980’s most publicly-owned wastewater treatment works

(POTWs) and industrial facilities in the Lake Michigan Basin discharging one million gallons or more of wastewater per day were meeting the 1 mg/L limit. Consequently, there is little incentive within the basin to financially support nonpoint BMPs in exchange for higher phosphorus discharge limits.

Time Element – The City of Ripon has some specific challenges complicating watershed-based trading. While the city must upgrade its facility, city officials are concerned about remaining in compliance with permit limits while continuing to serve their industrial and commercial base. The current facility is 20 years old, and is treating wastewater three times greater than the original design capacity. At the time Ripon was approached by the DNR to consider watershed-based trading in December, 1999, facility planning had been ongoing for a year.

Correlation of Phosphorus with other Parameters – The incentive for the City of Ripon to trade is driven by tighter BOD and ammonia nitrogen limits. Ideally, Ripon would like relief from its BOD and ammonia limits in exchange for the city removing other nutrient pollutants from the watershed through implementation of nonpoint source pollution controls. Trades involving BOD and/or ammonia nitrogen limits for phosphorus BMPs were discussed. However, determining the relationship between phosphorus and other pollutants is not clearly understood and would require an extensive study. Current state regulations require that trading must involve the same pollutant or the same water quality standard.

In the Lake Michigan basin, watershed-based trading of phosphorus is expected to become more viable if limit requirements for point sources drop below 1 mg/L. This will make point and nonpoint source watershed-based trading an important part of a united watershed approach.

Red Cedar River Basin

The Red Cedar Watershed, located in west central Wisconsin, is part of the Lower Chippewa River Basin. The Red Cedar River Basin drains approximately 1800 square miles and includes parts of Barron, Chippewa, Dunn, Polk, Rusk, Sawyer, St. Croix, and Washburn Counties. Northern parts of the basin are predominantly forested and agriculture is a dominant land use in the rest of the basin. Municipalities in the basin include Menomonie, Glenwood City, Downing, Boyceville, Wheeler, Colfax, Prairie Farm, Ridgeland, Dallas, Chetek, Turtle Lake, Almena, Barron, Cameron, Rice Lake, Cumberland, Haugen, and Birchwood.

This pilot project was started in 1994 under the oversight of the Red Cedar Steering Committee, a voluntary partnership for the trading project. The Steering Committee has met monthly to explore new ways to manage water resources within the watershed, including review of watershed-based trading proposals.

The partnership has been active in monitoring and developing a phosphorus management strategy. The committee incorporated as a nonprofit organization (Red Cedar River

Basin, Inc.) with a three-person board of directors. Monitoring efforts at Long Lake, Lake Chetek, Red Cedar Lake, and Rice Lake have provided hydraulic and nutrient data to supplement previous information the Department generated on Tainter Lake. The partnership is providing financial support for the pilot and helping coordinate completion of monitoring on Rice Lake between the DNR, the Rice Lake Association, and the Army Corps of Engineers.

Two communities remaining active in the watershed-based trading program are Cumberland and Colfax. The Turkey Store Company made a decision to build a new wastewater treatment plant at Barron after determining it was the most cost effective and reliable way to meet phosphorus requirements. Although trading is not likely, final design of the wastewater treatment facility may necessitate such an option.

Changes in the City Council and election of a new Mayor have delayed the City of Cumberland's implementation of trades. Interest remains high, however, in completing landowner trades and working with the Barron County LCD. The City is committed to staying on schedule to meet the October 1, 2000 deadline for obtaining a new wastewater discharge permit. Barron County's work has revealed the importance for more public information on trading, including better cost estimates. Barron County is designating the Hay River, and its drainage near Cumberland, as a priority area in their (draft) Land and Water Resource Management Plan.

The City of Colfax has also had some personnel changes, however, they continue to make progress in the trading process. The final implementation plan should be submitted for DNR approval before the end of October, 2000. The City has continued to work with the Dunn County LCD and has hired a crop consultant to work with local landowners. These contacts have lead to the identification of three farms to potentially implement phosphorus removal practices. The Village of Colfax will determine current costs associated with watershed-based trading and present this information at their September, 2000 village board meeting.

The educational component of the watershed-based trading program reached its first milestone through the use of an information booth at the Colfax Free Fair, June 15 to June 18, 2000. The booth, staffed with Village representatives and DNR personnel, provided information about restoration of Eighteen Mile Creek and the phosphorous watershed-based trading program.

In order to take the next step in a trade, this pilot needs to establish the exact phosphorous credit for specific BMP's. Differing information from the Cumberland report, the Conservation Reserve Enhancement Program (CREP) model, and the Rock River project, are making it difficult to decide how much credit can be obtained by implementing individual BMP's. BMP phosphorous credits will need to be established prior to trades taking place in either of these municipalities.

Rock River Basin

The Rock River Basin is located in south central Wisconsin. The 3,000 square mile, diamond shaped basin covers an area roughly bound by the Horicon Marsh to the north, the City of Beloit to the south, the City of Madison to the west and the City of Oconomowoc to the east.

Nutrient trading has been actively discussed in this area since 1996. The Department's 1997 Memorandum of Understanding (MOU) with the Rock River Watershed Partnership (RRWP) committed the Department to a three year project exploring alternative methods of removing phosphorus and improving water quality. Approximately 60 signers of the MOU are actively participating in the partnership.

During the last year, the Rock River Basin trading pilot made significant progress answering the question: "Is watershed-based trading an environmentally beneficial, cost effective approach to improving water quality in the Rock River Basin?" The work plan developed and implemented by the Department and the RRWP is nearly complete. Funding for the \$354,000 work plan was provided by a combination of grants from WDNR and EPA, and from assessments paid by POTWs who are members of an intergovernmental group (established under s. 66.30, Wis. Stats.). The information developed in the work plan will assist POTWs and industries considering trade options to meet required phosphorus limitations.

Work plan elements and accomplishments include the following:

1. Modeling of Nutrient Loading in the Watershed. A comprehensive pollution source computer modeling effort called SWAT (Soil and Water Assessment Tool) was used. The focus of the modeling was to construct an intermediate level, macro-scale model to better quantify phosphorus loading from point and nonpoint sources throughout the basin. The three main goals of the modeling effort are:
 - a. Estimate the average annual phosphorus load from external sources to the Rock River surface waters.
 - b. Estimate the relative contribution of phosphorus loadings from point and non-point sources.
 - c. Estimate annual phosphorus loading changes due to implementation of nonpoint source pollution BMPs and point source controls (based on Ch. NR 217 effluent levels).

Under existing land use and management conditions the model predicted an annual phosphorus load of approximately 1.7 million pounds. Point sources accounted for an estimated 41 percent and nonpoint pollution sources accounted for an estimated 59 percent of the total. Evaluation of various BMPs indicate that if implementation of

Ch. NR 217 measures (applicable point sources meet 1 mg/l of phosphorus) and changes in tillage practices and nutrient application practices are applied, the total phosphorus basin wide load could be reduced by approximately 40 percent. This reduction is the representation of a hypothetical “best case” condition. An estimated 25 percent reduction in load is obtainable by implementing Ch. NR 217; another 14 percent reduction is obtainable by implementing improved tillage and nutrient management practices. The model wasn’t able to estimate additional load reductions achievable by applying other BMPs such as vegetative filter strips and wetland restorations.

In addition to estimating phosphorus loads, the model generated information on sediment loads coming from nonpoint sources. Under existing conditions approximately 160,000 tons of sediment are delivered annually to the basin’s water resources. SWAT predicted, through implementation of improved tillage practices, sediment loads could be reduced by almost 20 percent (not including potential reduction through buffer strips, wetland restoration, and other BMPs). The model also identified watersheds with the largest, relative, phosphorus loads. This information will be used to target watersheds for trades.

2. Water Quality and Flow Monitoring. To assess current water quality conditions and gather information for hydrologic and water quality modeling, the Rock River Watershed Partnership conducted an extensive two year water quality and flow monitoring assessment at nine basin locations. USGS and DNR coordinated sample collection following standardized procedures. The monitoring data will provide background levels to measure water quality changes in the future. The second year of monitoring will be completed in August 2000. Current monitoring data is accessible through the USGS Website (<http://wi.water.usgs.gov>).
3. Development of a Watershed-Based Trading Structure and Framework. The objective of this work plan element is to develop a standardized framework where trading can occur with a minimum of overhead costs. Sample trading approaches and supporting documentation were developed by representatives for a broad-based work group: municipalities, industry, DNR, UW Extension, Natural Resources Conservation Service, county Land Conservation Departments, and a consulting company.

The **Administration Pollutant Trading Work Group** developed a list of 47 issues of concern regarding implementation of trades. Consensus was reached concerning how these items and issues would be specifically addressed as part of a trade.

The **Trade Ratio Work Group** reached consensus on the use of trade ratios. The trade ratio is the amount of phosphorus a point source trader must remove by implementing non-point BMPs compared to the amount of phosphorus discharged from the facility. In general, a base ratio is established with modifications for site specific conditions. Trade ratios for point-to-nonpoint source trades could range from 1.75 to 2.25 pounds nonpoint source phosphorus for 1 pound point source phosphorus.

The **Trade Targeting Work Group** identified eight specific watersheds in the Rock River Basin where incentives would be given to encourage trades.

The **Contract Language Work Group** developed a standardized format for trade contracts. The work group agreed that prospective trade initiators must declare their intent to trade by April 30, 2000. The date for final declaration of intent to trade was delayed to July 1, 2000 to allow completion of ongoing studies. (As described below, ten treatment facilities have declared their intent to pursue implementation of a trade). Trades must be completed (have NPS pollution BMPs installed or a point to point trade completed) by the dates listed in WPDES permit compliance schedules. Dischargers deciding not to trade must complete a facility upgrade according to their WPDES permit compliance schedule.

4. Treatment Cost Evaluation. Studies were conducted to determine comparative costs of phosphorus removal at a wastewater treatment facility versus implementation of agricultural best management practices (BMPs). While cost comparisons may indicate phosphorus removal by installing nonpoint source BMPs through the trading process may be economical, each trade must be evaluated on a case-by-case basis. A review of actual costs of phosphorus removal at 20 facilities designed and constructed to meet Ch. NR 217 requirements (11 employing chemical removal and 9 employing biological removal) found costs ranging from \$0.40 per pound of phosphorus removed to \$20 per pound of phosphorus removed with most falling in the \$2 to \$10 per pound range. Large treatment plants were generally able to achieve the lowest per pound cost for removal.

To determine a true cost comparison between point and nonpoint phosphorus control, the appropriate trade ratio must be applied to nonpoint source pollution control costs. Land slope is a variable in each of the following cost estimates. Costs for phosphorous removal by converting moldboard plowing to conservation tillage range from \$0.50 to \$4.50 per pound. No-till costs for phosphorus removal range from \$0.40 to \$2.50 per pound. Phosphorus removal by installing 50 foot vegetative buffer strips range from \$1.00 to \$100.00 per pound, depending tillage practices.

5. Biological Effects of Phosphorous in the Rock River. The objective of this analysis is to determine the relationship of phosphorous to water quality impairments in streams and rivers in the Rock River Basin. The response of rivers and streams to nutrient loading has not been well studied or understood. Studies conducted by K. W. Potter, et al. (Stream Quality in the Rock River Basin of Wisconsin, Department of Civil & Environmental Engineering, University of Wisconsin-Madison, April 11, 2000) and Paul Garrison (WDNR, Integrated Science Services) correlated physical and chemical factors with biological indicators of stream health. Potter focused his study on small subwatersheds affected primarily by agriculture with no point source discharges. Phosphorus levels exceeded 0.1 mg/L (very high) in 8 of the 14 streams studied. *Chlorophyll a* concentrations correlated with phosphorus levels, but algae was not a significant problem in smaller streams which typically have steeper

gradients. Potter felt fine grained sediment was the most serious problem in the streams he studied.

Garrison looked at the affects of phosphorus in the Rock River main stem as well as the tributary streams studied by Potter. He concluded phosphorus appeared to be much more important than sediment in degrading water quality in the basin as evidenced by the high algal levels in the main stem and impoundments. Below Hustisford, the Rock River is similar to a long, narrow, lake with algae levels affected by high phosphorus concentrations during summer and fall. Nutrient levels in the tributary streams at certain times are higher than in the main stem of the Rock River, but algal populations are lower due to physical factors. The diatom community (algae) was found to be a better indicator of nutrient levels in streams than were macroinvertebrates (insects and fish). Statistical analyses indicate the most important variable affecting the aquatic community is phosphorus.

As of July 1, 2000, ten treatment facilities (eight municipal and two industrial) have indicated their intent to pursue implementation of a watershed-based trade. Trade options investigated include converting tilled land to permanent grass cover, restoration of drained wetlands, wetland restoration to filter urban runoff, and carp removal. Other approaches investigated included converting moldboard tillage to conservation and no-till practices, and establishment of vegetative buffer strips adjacent to waterways. Parties interested in trading are working with consultants and county Land Conservation Departments to evaluate phosphorus removal requirements and appropriate BMPs to achieve phosphorous reductions. At least one POTW with excess phosphorus removal capacity is considering negotiating point-to-point trades with facilities exceeding their Ch. NR 217 limits.

The feasibility of watershed-based trading in the Rock River Basin is still being determined. In the next few months, potential traders will develop construction cost estimates to meet Ch. NR 217 requirements. These estimates will then be compared to nonpoint source pollution BMP installation costs for removal of phosphorus as determined by trade ratio formulas.

The other part of the trade process is the willingness of landowners to participate in trades with WPDES dischargers. The Jefferson County Land Conservation Department surveyed farmers by mail to determine landowner interest to participate in a nutrient trade. Landowner interest in contracts up to six years was greater compared to longer term contracts. The survey had a 61.4 percent response rate; results are listed below:

Total amount of land respondents would consider converting:

- 5,408 acres from conventional tillage to conservation tillage at an average cost of \$31/acre.
- 6213 acres from conservation tillage to no-till at an average of \$30/acre.

- 3678 acres from conventional tillage to no-till at an average of \$41/acre.
- 1302 acres of tilled land to wetlands for \$651/acre.
- 71,600 feet tilled lands to buffers at \$53/foot.

The LCDs in Dane County and Fond du Lac County are also actively working with POTW's to help facilitate trades. The availability of LCD staff expertise is an important component to successfully locate and complete watershed-based trades. However, most LCD's have full workloads and are unable to devote much time to assist in the trading process.